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ABSTRACT

This report on current research at Sweden's University of Linkoping on the dynamics of technical progress, social change, and continuous educational reform focuses on the four major sub-studies that, with a number of more limited surveys, make up the project on Technology and Science in School and Society: Education, Training, Subsequent Training. The starting point of this project was Sweden's introduction of the 1980 Compulsory School Curriculum (Lgr 80), which mandates the teaching of technology at all three levels of compulsory schooling. Each of the four major sub-studies is described: (1) "Technology as an Example of Making and Installing a Curriculum," which deals with the political and education-administrative process during the 1970s; (2) "Science Technology INSET and Pupil Attitudes toward Technology," which examines the effects of science/technology on classroom teachers and the attitudes of 12- to 13-year-old students toward technology; (3) "Educational Activities of the Labor Movement 1945-1970: Attitudes to Technology and Education," which discusses whether, and if so, how this "technology- and science-impregnated" social change is reflected in discussions of the policy and activities of the Workers' Educational Association; and (4) "Ideas Concerning Social Change, Technical Progress and the Role of Education," which examines social policy and its relevance to education and technology. Minor surveys concerned with humanistic perspectives in technical education and technology in school teaching materials are briefly described, and 10 publications related to the project are listed. (The related publications are all in Swedish.) (DJR)

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Current project

TITLE OF PROJECT: TECHNOLOGY AND SCIENCE IN SCHOOL AND SOCIETY: EDUCATION, TRAINING, SUBSEQUENT TRAINING

In the course of public debate, major questions of a general nature are frequently nominated as "compulsory school subjects". Few actually acquire this status, but with the introduction of the 1980 Compulsory School Curriculum (Lgr 80), technology, which had previously been an elective senior-level subject, was made a compulsory teaching item at all three levels of compulsory school. This provides the starting point of the present project.

Another starting point is provided by the technical progress which is influencing all sectors of human life. That progress has remedied material deficiencies, eliminated many heavy jobs and augmented cultural amenities. At the same time, there are feelings of alienation and vulnerability associated with various technical aspects of modern society. The human situation in the technological society is both contradictory and confusing, whether man is just regarded or allowed to speak for himself.

What goes on in the field of tension between technical progress, social change and continuous educational reforms is a question relevant to the project as a whole. All three of these factors are interdependent. Even if they can never be entirely uncovered, their dynamics can be elucidated. This is being done in four major sub-studies and in a number of more limited surveys.

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Technology as a new compulsory subject in schools

In the course of public debate, major, universal issues are frequently nominated as "compulsory school subjects". Few actually acquire this status, but the new compulsory subject of technology is one exception to the rule. Formerly an elective subject at senior level, with the implementation of the new Compulsory School Curriculum (Lgr 80) it became a compulsory teaching item at all three levels of compulsory school. This new feature of school work has aroused numerous and mixed feelings, most explicitly at junior level, but also at intermediate and senior levels.

> "They just go and cook up something new, and then next thing they expect us teachers to start teaching technology without any proper instructions or kits of teaching materials. And this kind of teaching is completely new to us!"

This intermediate-level teacher was expressing a widely held professional opinion. Others have testified that technology as a teaching subject has opened their eyes to a completely new way of looking at teaching and learning - mostly as a result of the in-service training they have been given. This is what one junior-level teacher has to say:

> "It's convinced me that the investigative approach is essential for teaching technology at junior and intermediate levels. In this way technology supports the learning of basic skills, especially for children with learning difficulties. The teacher's view of his professional role is the biggest obstacle to technology teaching. Scientific qualifications are lacking. Technology lessons require a great deal of preparation. The pupils expect the teacher to know everything." (1)

Both these examples make it clear that technology frequently presents a challenge to several traditions of teaching in schools. One such tradition is the conception of a school where you talk, read and write about things which are somewhere else. Another is that the teacher's job is to communicate facts and supply the right answers. A third is that things must be kept separate: Swedish must be kept on its own, mathematics on its own and - technology on its own?!

It is equally clear that technology in this respect touches on one of the changes which politicians professed to be aiming for with Lgr 80, viz a larger element of practical work in school, especially at senior level. Practical work was taken among other things to include a larger proportion of teaching and learning situations in which the pupils themselves tracked down the knowledge they were meant to acquire - in other words, the investigative approach.

Other political deliberations connected with technology as a school subject were concerned with a desire to strengthen the position of science subjects in school, to make pupils more interested in these subjects and to improve the knowledge and attitudes of girls concerning science and technology as a part of school work. There were two considerations which were more a matter of general than educational policy. The terms of reference issued in 1976 for the Lgr 69 reviewing body stressed that schools, more than ever before, both were and should be an object of influence and interest on the part of the community at large. Secondly, it was observed that our complicated, technified society was getting more complicated and technified all the time and that it was absolutely essential to establish a general programme of education which included a fair amount of technical instruction. So much for the deliberations of the Riksdag (i.e. the Swedish Parliament), politics and curricular review (2).

Technical progress, social change, continuous educational reforms

One of the starting points of this project is the fact of technology having to become a compulsory subject throughout compulsory school and of various supportive measures having been organised for this change, including a massive INSET campaign. Another starting point is connected with the two considerations of general policy mentioned above. Technical progress impinges on all sectors of human life. It has remedied most of the material deficiencies of our western society, it has eliminated many heavy, dirty, deleterious jobs, and it has augmented cultural amenities in both quantitative and qualitative terms, as well as the availability of those amenities to the common man. At the same time, there are feelings of distaste, alienation and vulner-

ability connected with various technical aspects of modern society. Mass production of dubious value - insofar as it is not downright vicious - is one such aspect. Radical rationalisation, made possible by the development of new technology, frequently results in unemployment, while the remaining job opportunities are substantially depleted. Mass culture readily becomes "trash culture", subordinate to commercial dictates. Instead of giving spiritual revival and moral/ethical development, mass media, through their portrayal of violence, can be the cause of mental illness. Man's situation in the technological society is both contradictory and confusing. Whether we contemplate man or allow him to speak for himself.

The events taking place in the field of tension between technical progress, social change and continual educational reforms are a question of common concern to the project as a whole. All three of these factors are interdependent and, even if they can never be uncovered completely, their dynamics can be elucidated. This is being done in four major sub-studies and a number of more limited surveys.

Technology as an example of making and installing a curriculum

One sub-study deals with the political and education-administrative process which took place during the 1970s at national and regional levels, resulting in the decision to introduce a new curriculum in which technology acquired the status of a school subject in its own right in the time schedules (though only at senior level). In addition to politicians and officials, this process also involved representatives of other sectors besides the educational system. The nucleus of the process comprises work on the review of Lgr 69, which occupied most of the 1970s and led to the issue of Lgr 80. That study is being based on a review of documentation, combined with interviews of the actors involved.

Science/technology INSET and pupil attitudes towards technology

One study concerned the effects of science/technology INSET on class teachers. Questionnaire and observation methods were combined here with a life-history of teachers, added to which about 400 grade 5 pupils were given an achievement and attitude test. Some of the questions asked were also included in the current IEA-Science II survey.

Another sub-study concerns the attitudes of 12- and 13-year-olds to technology and the value they put on it, mainly as a social phenomenon. That study is being undertaken internationally, together with about 10 other counties (Australia, Belgium, France, the Netherlands, Canada, Kenya, Nigeria, Poland, Great Britain, Sweden and the USA) and is being co-ordinated from the Netherlands. Our sample of pupils was selected in such a way that it was also possible for the study to include interviews with the teachers whose science/technology INSET took place three or four years ago. These teachers were in charge of half of the just under 500 pupils, the other half being taken by teachers who had not undergone in-service training and who, moreover, were serving in schools where few if any teachers had received INSET and where there was no local science/technology development work in progress. These criteria were to apply when the pupils were in grade 6. Half the pupils, however, were taken from grade 7, so as to capture any effects of the transition between school levels.

The study is expected to supply the answers to such questions as (1) whether the pupils feel that they have been taught technology, how they have understood the teaching, what they have thought of it, (2) what general conceptions and opinions they have of technology and in what way their views are connected with their intermediate-level teachers having received or not received science/technology INSET. The effect of science/technology INSET on the teachers concerned will also be investigated. This generation of knowledge will further benefit from co-operation between the Department of Comparative Education, Stockholm University, and the Technology and Social Change Topic, as well as from a small direct study of four science/technology INSET courses.

Educational activities of the labour movement 1945-1970: attitudes to technology and education

The focal topic of this study is the educational activities of the labour movement between 1945 and 1970, a period of rapid change in both individual and societal conditions. Science and technology played a crucial role in this transformation, not only in the palpable physical sense - i.e. in the form of new machinery and products - but also through the manner in which work, voluntary associations and societal institutions of different kinds were organised. The expression "social engineering" can be taken as the manifestation of a technical rationality characterising many important sectors of the life of the community. The study is aimed at ascertaining whether, and if so how, this "technology- and science-impregnated" social change is reflected in discussions of the policy and activities of the Workers' Educational Association (ABF).

The study begins with a short discussion of the concepts of education and technology. The section which then follows deals with the development of ABF between 1912 and 1945. The main chapter is a chronological review of the period between 1945-1970, in which the following questions are highlighted. How did ABF's spokesmen describe social developments during the period in question, what importance did they attach to technology and science, and what view did they take of their own educational mission in a democratic society? This will be followed by two sections dealing with production, working life and education, and secondly with mass media technology and education, above all with reference to ABF's standpoint concerning the introduction of television in Sweden.

Ideas concerning social change, technical progress and the role of education

This study is concerned with social policy generally, with special relevance to education and technology. Four official reports from the 1960s and 1980s respectively are used to shed light on ideas of social

development (images of the future), technical progress and the role of education.

The official committees set up in Sweden to investigate policy questions frequently constitute a meeting point between ad hoc problem solving and long-term decisions relating to future needs. What is more, the remits of these bodies are frequently geared to a particular problem area or a particular sector of society. This can involve a risk of the committee "not seeing the wood for the trees", but it can also imply a risk of "the future" becoming the prisoner of the present. A long-term perspective involves elements of uncertainty, which in turn make it impossible to find the "right" solution; instead one has to value and select. Which problem fields do the official inquiries single out, which facts do they feel to be worth mentioning, what developments do they consider desirable/probable? These are some of the questions which will be involved. One central task will be to elucidate the attitude shown towards motive forces of social development, the controllability of technology and the role of education as a factor of change/steering instrument.

The official reports which have been selected are concerned with the reform of upper secondary schooling in the 1960s and 1980s respectively, and with investigations of the development and applications of information technology. The first major Swedish inquiry on IT lasted from 1955 to 1962. In addition, the Ministry of Education and Ecclesiastical Affairs appointed, in 1964, a commission to investigate vocational training for ADP. The 1980s "counterpart" of these official inquiries into IT is the Commission on the Effects of Computerisation on Employment and the Working Environment (the DEU Commission), which conducted its inquiries between 1978 and 1984. Work on preliminary analyses and descriptions of the main reports of each official inquiry began this year. This work will continue, conjointly with a theoretical definition of the problem field.

Other surveys

A minor special survey involves charting and analysing the activities conducted between 1943 and 1964 by the "Committee for Humanist Perspectives in Technical Education". Those activities consisted of lectures on humanist, social and psychological questions at technical high schools, with the express aim of counteracting the lopsidedness of purely technical education and of giving prospective engineers a wider view of technology and its role in the community. This study will be based on the Committee's surving achives.

Two minor surveys have been concerned with technology in compulsory school teaching materials. In one of them, all main teaching materials for intermediate level have been collected and analysed with respect to the organisation of the subject matter. In the other study, one topic - electricity - has been followed in the teaching materials for all school levels. The findings indicate that, with occasional exceptions, the subject matter is presented on a traditional, disciplinary basis, organised for lecture-room pedagogics, and that teaching materials over the years have if anything presented a reverse progression, with abstract treatment in junior level textbooks and more detailed and lucid treatment in teaching materials for the senior level of compulsory school.

NOTES

(1) Quoted from the report "Experiments For Change" (see below).

(2) Current News From the National Board of Education 1975/76:45.

REPORTS

The following are some of the publications which have appeared as part of the project or with reference to it.

Hasselrot, T. and Ingelstam, L. (ed.) Skruven. En diskussionsbok om tekniken i vår verklighet. Stockholm, Liber, 1983.
(The screw. A discussion book on technology in our reality.)
(In Swedish)
Edited by Lars Ingelstam, this book is addressed to teachers and INSET trainers, among others. Contributors, apart from Lars Ingelstam himself, include Ulla Riis (and other members of the Technology Topic team.

Ingelstam, L. På spaning efter den helhet som flytt. Ett tänkestycke om integration i undervisningen. Arbetsnotat 23, Tema Teknik och social förändring, Universitetet i Linköping, 1985.
(Remembrance of wholeness past.)
(In Swedish)

Magnusson, A. Teknik och naturvetenskap i skolans lokala arbetsplan. (Technology and science in the local school working plan.) Degree thesis in education. Pedagogiska institutionen, Universitetet i Linköping, 1983.
(In Swedish)

Mårdsjö, K. Teknikämnets läroböcker. En studie av framställning, språk och innehåll i några av grundskolans teknikböcker. Arbetsnotat 11, Tema Teknik och social förändring, Universitetet i Linköping, 1985.
(Technology textbooks. A study of presentation, language and content in books used in compulsory school.)
(In Swedish)

Nissen, J. and Riis, U. Datalära på grundskolans högstadium. En ögonblicksbild från tre kommuner och sex skolar vintern 1984/85. Tema T Rapport 10, Tema Teknik och social förändring, Universitetet i Linköping, 1985.
(Computer science at the senior level of compulsory school. A snapshot view of three municipalities and six schools, winter 1984/85.)
(In Swedish)

Richardson, G. Teknikämnet i grundskolan - utbildningshistoria på avvägar. Forskning on Utbildning, nr 2, 1985.
(Technology in compulsory schools - educational history goes astray.)
(In Swedish)

Riis, U. Integration in skolreformernas dokument. Arbetsnotat 24, Tema Teknik och social förändring, Universitetet i Linköping, 1985.
(Integration in documents of educational reform.)
(In Swedish)

Riis, U. Teknikämnet - i går, i dag, i morgon.
(Technology as a teaching subject - past, present and future.) Published in the final report, "Experiments for Change", on the Linköping and Åtvidaberg Experimental Education Area, 1985.
(In Swedish)

Riis, U. Effekter av en ny typ av fortbildning. Från fortbildningskurs till FbU. Tema Teknik och social förändring, Universitetet i Linköping, 1986. (In preparation)
(Effects of a new type of INSET.)
(In Swedish)

Vinthagen, K. Fortbildning i NO/Teknik för låg- och mellandstadielärarna. En utvärdering med reflektioner. Tema Teknik och social förändring, Universitetet i Linköping, 1985.
(Science/technology INSET for junior and intermediat level teachers. A reflective evaluation.)
(In Swedish)

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